

Abstract for Flight Software Workshop – 2017

Title: Application of CFS to a Lunar Rover

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Resource Prospector (RP) is a lunar mission sponsored by NASA's Advanced Exploration Systems (AES) division, that aims to study in-situ resource utilization (ISRU) feasibility and technologies on the surface of the moon. The RP mission's lunar surface segment includes a rover equipped with a suite of instruments specifically designed to measure and map volatiles both at the surface and in the subsurface. Of particular interest is the quantity and state of volatiles in permanently shadowed regions. To conduct the mission, ground system operators will remotely drive the rover, directing it to waypoints along the surface in order to achieve measurement objectives. At selected locations, an onboard drill will be deployed to collect material and obtain direct measurements of the subsurface constituents. RP is currently planned for launch in 2022. RP is managed at NASA Ames Research Center. The RP Rover is being designed and developed by NASA Johnson Space Center (JSC) in partnership with NASA Ames. NASA Kennedy Space Center (KSC) is responsible for the Honeybee drilling system and science payload.

In order to better understand the technical challenges and demonstrate capability, in 2015 the RP project developed a rover testbed (known as RP15). In this "mission in a year", a rover was designed, developed, and outfitted with science instruments and a drill. The rover was operated from a remote operations center, and operated in an outdoor lunar rock yard at Johnson space center. The study was a resounding success meeting all objectives. The RP Rover software architecture and development processes were based on the successful Lunar Atmosphere and Dust Environment Explorer spacecraft. This architecture is built on the Core Flight System software and an interface to Matlab/Simulink auto-generated software components known as the Simulink Interface Layer (SIL). The application of this lunar satellite inspired framework worked well for the rover application, and is currently being planned for the mission. This presentation provides an overview of the architecture and processes, and describes some of the changes and challenges for the rover application.